Interactive Crevasse and Snow Mound Tracking

Task Overview

A crevasse is a fracture in a glacier caused by enormous tensile stresses at or near the glacier's surface. A snow mound is simply an accumulation of snow forming a hill-like structure. Accelerations in glacier speed cause extension and can initiate a crevasse. Crevasses often have vertical or near-vertical walls that sometimes expose layers that represent the glacier's stratigraphy. Tracking crevasse and snow mound movement is an excellent way for scientists to determine actually how far a glacier has moved within a certain span of time. Crevasses also pose a danger to scientists in the field in that they can be hidden from plain sight by a recent snowfall or an unstable snow bridge.

Standards

National Science Education Standards addressed:

- ✓ **Science as Inquiry-Content Standard A**
- ✓ **Energy in the Earth System-Content Standard D**
- ✓ **History and Nature of Science-Content Standard G**

Benchmarks for Science Literacy addressed:

- ✓ **The Nature of Science**
  - **1_B-Scientific Inquiry**
  - **1_C-The Scientific Enterprise**
- ✓ **The Physical Setting**
  - **4_B-The Earth**
  - **4_C-Processes that Shape the Earth**
- ✓ **Common Themes**
  - **11_A-Systems**

Objectives

A. **Students will determine the distance several crevasses have traveled over a 6.94 year period.**
B. **Students will identify the crevasses on a set of Landsat images along the Bindschadler Ice Stream in West Antarctica.**
C. **Students will identify and track several snow mounds and compare their rates to the crevasses.**

Materials

Landsat images of crevasses and snow mounds from 1985 and 1991
Internet-ready computer with JAVA enabled browser.

Procedure

Part I: Crevasse Tracking

1. **You will be estimating the distances crevasses have moved from January 02, 1985 to December 12, 1991.**
2. **Locate Crevasse A on the 1985 image. This is labeled.**
3. **Locate the new location of Crevasse A on the 1991 image. This is not labeled, it is your job to find it.**
4. **Using the 2 km scale provided, estimate how far you think the crevasse has moved over the 6.94-year time period. Enter your estimate into Table 1a.**
5. **Convert your estimate in kilometers to meters. Entire your conversion into Table 1a.**
6. **Determine how far the crevasse has traveled in meters/year. Enter your calculation into Table 1a**
7. **Repeat for all Crevasses B-E.**
8. **Once you have all your estimated measurements entered into Table 1a, go to http://lima.gsfc.nasa.gov/mysteries/q1/index.php?page=Crevassed**
9. **Using the online applet tool, measure the distance each crevasse has traveled. Enter this information into Table 1b.**

Enter how close your estimates were to the computer-generated model. Enter this information into Table 1c.

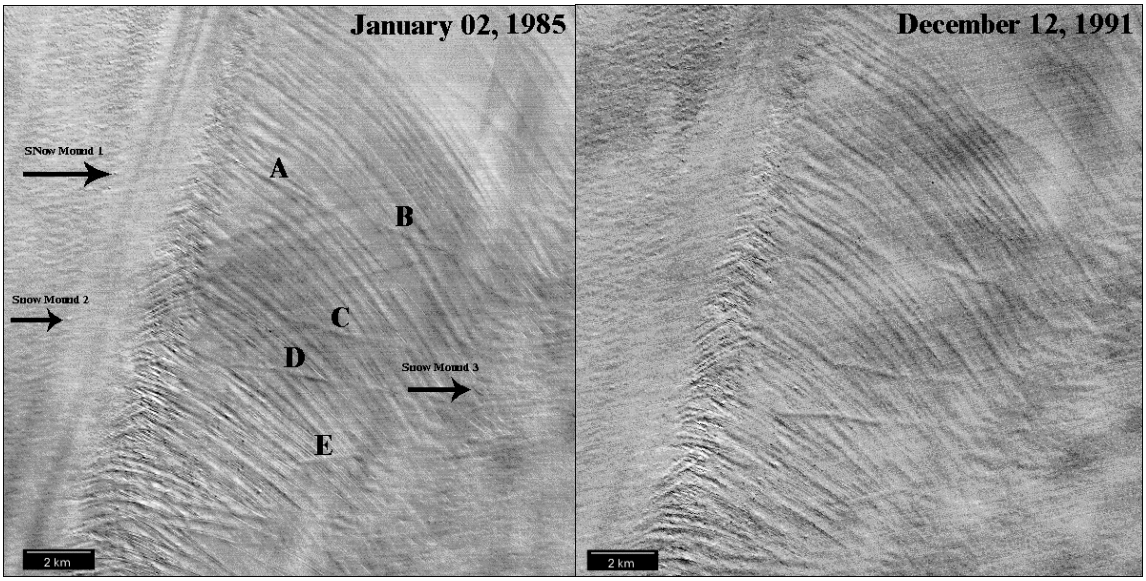

Table 1a

Crevasse	Estimated Distance Traveled (km)	Conversion to meters	Distance Traveled (m/year)
Crevasse A			
Crevasse B			
Crevasse C			
Crevasse D			
Crevasse E			

Table 1b

Crevasse	Computer-Generated Distance/year (m)
Crevasse A	
Crevasse B	
Crevasse C	
Crevasse D	
Crevasse E	

Table 1c

Crevasse	Difference between Your Measurement and Computer-Generated Measurement (m/year)
Crevasse A	
Crevasse B	
Crevasse C	
Crevasse D	
Crevasse E	

Part II: Snow Mound Tracking

1. **You will be now be estimating the distances snow mounds have moved from January 02, 1985 to December 12, 1991.**
2. **Locate Snow Mound 1 on 1985 image. This is labeled.**
3. **Locate the new location of Snow Mound 1 on the 1991 image. This is not labeled, it is your job to find it.**
4. **Using the 2 km scale provided, estimate how far you think the snow mound has moved over the 6.94-year time period. Enter your estimate into Table 2a.**
5. **Convert your estimate in kilometers to meters.**
6. **Determine how far the crevasse has traveled in meters/year.**
7. **Enter all your information in Tables 2a, 2b, and 2c below.**
8. **Repeat for Snow Mounds 2 and 3.**
9. **Once you have all your estimated measurements entered into the table, go to http://lima.gsfc.nasa.gov/mysteries/q1/index.php?page=Crevassed**
10. **Using the online applet tool, measure the distance each snow mound has traveled.**
11. **Enter the computer-generated values in the table section below.**
12. **Enter how close your estimates were to the computer-generated model.**

Table 2a

Snow Mound	Estimated Distance Traveled (km)	Conversion to meters	Distance Traveled (m/year)
Snow Mound 1			
Snow Mound 2			
Snow Mound 3			

Table 2b

Snow Mound	Computer-Generated Distance/year (m)
Snow Mound 1	
Snow Mound 2	
Snow Mound 3	

Table 2c

Snow Mound	Difference between Your Measurement and Computer-Generated Measurement (m/year)
Snow Mound 1	
Snow Mound 2	
Snow Mound 3	

Assessment

1. **Were your estimates accurate? If not, what do you think the reason was for the inaccuracy?**

2. **Why is knowing how crevasses move an important variable for scientists and research in Antarctica to know?**

3. **Where is the ice moving the fastest in this image? The slowest?**

4. **How can we translate the crevasse tracking you have seen in this activity to larger scale global changes?**